

METHODOLOGICAL INTEGRATION IN
PSYCHO-ECOLOGICAL RESEARCH: A STRUCTURED
STUDY AND INTERDISCIPLINARY FRAMEWORK

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Received on May 3, 2026

Presented by K. Stoykova, Corresponding Member of BAS, on July 28, 2026

Abstract

Environmental challenges require interdisciplinary approaches integrating psychological and ecological perspectives. This structured study compares the principal methodological approaches used in psycho-ecological research, including quantitative, qualitative, mixed-methods, and computational methods. Their strengths and limitations are synthesised to develop an integrated methodological framework supporting transparent and interdisciplinary research. The study indicates that combining complementary methods provides a more comprehensive understanding of human–environment interactions than isolated methodological approaches.

Key words: psycho-ecological research, environmental psychology, interdisciplinary methodology, mixed-methods, computational methods, sustainability

Introduction. Environmental problems such as climate change, biodiversity loss, and ecosystem degradation require interdisciplinary approaches capable of explaining interactions between human behaviour and environmental systems [1–3, 5]. Psycho-ecological research integrates psychology, ecology, environmental sciences, and public health to investigate how environmental conditions influence cognition, emotions, behaviour, and well-being while recognising the reciprocal impact of human activities on ecosystems [1, 10, 11, 16].

Environmental psychology demonstrates that environmental attitudes, climate-risk perception, and adaptive behaviour are influenced by interacting psychological and environmental factors, whereas environmental stressors affect mental health and cognitive functioning [2, 3, 5–10, 17]. Recent methodological developments, including GIS, remote sensing, ecological modelling, and machine-learning techniques, have expanded opportunities for integrating behavioural and environmental data [8, 9, 11, 13, 15].

This study compares the principal methodological approaches applied in psycho-ecological research and proposes an integrated methodological framework for future interdisciplinary investigations.

Methodological approach. A structured narrative study with comparative methodological synthesis was conducted. Peer-reviewed studies were identified through Web of Science, Scopus, and Google Scholar using keywords related to psycho-ecological research and interdisciplinary environmental methodology. The selected studies were compared according to research design, methodological characteristics, strengths, limitations, and applicability to interdisciplinary psycho-ecological research [11, 12, 15].

Results. Comparative methodological synthesis. The reviewed literature demonstrates that psycho-ecological research benefits from combining complementary methodological approaches. Quantitative methods provide statistically robust evidence, whereas qualitative methods contribute contextual understanding of environmental perceptions and behavioural adaptation [?, 2–6, 10, 14, 18, 19]. Mixed-methods designs integrate these perspectives, while computational methods, including GIS, remote sensing, ecological modelling, and machine-learning techniques, improve interdisciplinary analyses of behavioural and environmental data [8, 9, 11, 13, 15].

Overall, the reviewed evidence indicates that methodological integration provides a more comprehensive understanding of psycho-ecological processes than any single research approach.

The comparison illustrates that the approaches are complementary rather than mutually exclusive.

Integrated methodological framework. Figure 1 presents the proposed integrated methodological framework. The framework links the research question, methodological design, comparative synthesis, integrated interpretation, and evidence-based conclusions. Methodological selection should be guided by the research question, while quantitative, qualitative, mixed-methods, and computational approaches are considered complementary components of interdisciplinary research.

The framework is intended as a flexible guide that can be adapted to different interdisciplinary research contexts.

Discussion. This study highlights the importance of methodological integration for investigating complex human–environment interactions. Quantitative,

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Comparative characteristics of methodological approaches in psycho-ecological research

Approach	Primary contribution	Limitations	Typical applications
Quantitative	Statistical analysis and hypothesis testing	Limited contextual depth	Surveys, experiments, longitudinal studies
Qualitative	Interpretation of perceptions and experiences	Limited generalisability	Interviews, focus groups, case studies
Mixed-methods	Integration of complementary evidence	Increased methodological complexity	Sustainability and climate adaptation research
Computational	Spatial analysis, predictive modelling and large datasets	Technical expertise and computational resources	GIS, remote sensing, ecological modelling, machine learning

Source: Developed by the author.

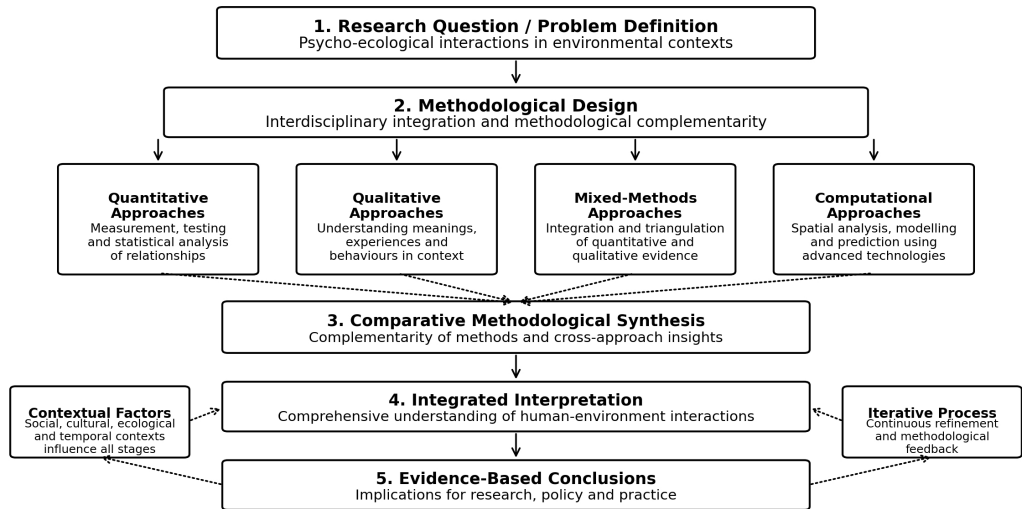


Fig. 1. Integrated methodological framework for psycho-ecological research

Source: Developed by the author.

qualitative, mixed-methods, and computational approaches provide complementary evidence that cannot be obtained through a single methodological tradition. The proposed framework supports transparent research design, interdisciplinary collaboration, and more comprehensive interpretation of behavioural and environmental data [8, 9, 11, 13, 15]. Future studies should evaluate its applicability through empirical investigations and systematic reviews.

Conclusions. Psycho-ecological research benefits from integrating quantitative, qualitative, mixed-methods, and computational approaches within a coherent

methodological framework. The proposed framework supports transparent, interdisciplinary, and evidence-based research and provides a practical methodological foundation for future psycho-ecological studies.

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